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FINAL REPORT

ARO GRANT: DAALO3-S6-G-0022

INSTITUTION: University of North Carolina at Chapel Hill

TITLE: Fellowships in Information and Stochastic Systems

PERIOD OF GRANT: 1 July 1986 - 30 June 1989

PRINCIPAL INVESTIGATOR: C.R. Baker

Summary of Research and Results Obtained

The most extensive results obtained with grant support were on the capacity of Poisson communication channels. Such channels are central to optical communications. The results obtained included information capacity and coding capacity when the channel noise intensity was permitted to be time-varying and random. Previous research on these problems was limited to channels with constant encoder intensity. In this same area, the information capacity of a Poisson channel subject to jamming was determined.

Other research carried out under the grant was on the analysis of communication channels containing additive spherically-invariant noise. Such channels arise in various applications when the additive noise can be represented as $(N_t) = (AG_t)$, where (G_t) is a Gaussian process and A is a positive random variable independent of (G_t) . Results obtained included coding capacity and information capacity. One interesting result obtained is that for matched spherically-invariant channels, the capacity with feedback is frequently greater than the capacity without feedback; this does not occur for Gaussian channels.

A small part of the work done under the grant was on computational evaluation of an algorithm for detection of nonGaussian signals in Gaussian noise. This algorithm has two versions; one is completely adaptive to the signal-plus-noise process. Preliminary evaluations were encouraging.

Papers Published

M.R. Frey, Capacity of the Poisson channel with random noise intensity, *Proceedings of the 1989 Conference on Information Sciences and Systems*, 66, Johns Hopkins University, Dept. of Electrical and Computer Engineering, Baltimore, MD 22-24 March 1989.

C.R. Baker, M.R. Frey, A.F. Gualtierotti, Some results on nonGaussian signal detection, *Proceedings of the 12th Colloque sur le Traitement du Signal et ses Applications*, 115-118, 1989.

Papers Submitted for Publication

M.R. Frey, Capacity of the Poisson channel with time-varying noise intensity and jamming, submitted to *IEEE Trans. Inform. Theory* (June, 1988).

Scientific Personnel Supported by the Grant and Degrees Awarded

1. D.G. Baldwin, graduate student.
2. M.R. Frey, graduate student.

No degrees were awarded to these students during the life of the grant.

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